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(54) ORGANIC POLYMER COMPOSITION, THIN CONDUCTIVE FILM MADE THEREOF AND PRODUCTION OF THIN FILM

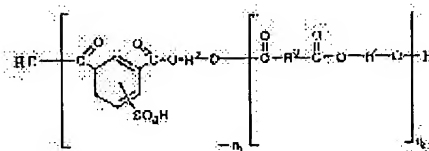
(57)Abstract:

PURPOSE: To obtain an organic polymer composition which is solvent-soluble in a doped state by mixing a specified polyaniline (derivative) with a dopant.

CONSTITUTION: This composition is obtained by mixing a polyaniline (derivative) having a weight-average molecular weight of 10000 or below with an at least equivalent amount of a dopant being a compound represented by formula I or II,

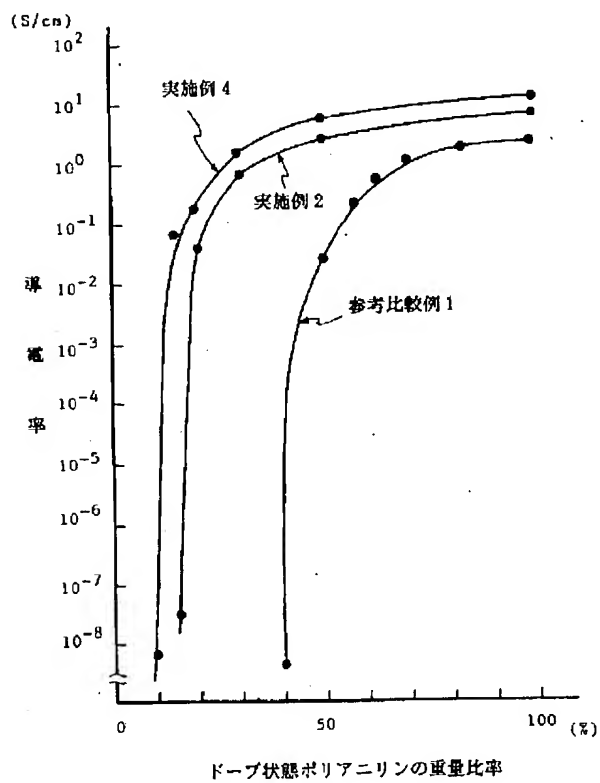
[wherein R1 is H, alkyl, alkoxy (carbony), polyoxyalkylenecarbonyl, alkenyl, alkylthioalkyl, aryl, alkylaryl, arylalkyl, alkoxyalkyl, alkylthio or the like; R2 to R4 are each alkylene or phenylene; m is 1-5; and n1 and n2 are each 1-50].

This composition is dissolved in a lowly corrosive and lowly toxic general-purpose solvent such as an ether, an alcohol, a nitrile or a ketone, and the solution is applied to a substrate and dried to obtain a thin conductive film having a conductivity of 10-9S/cm or above.



LEGAL STATUS

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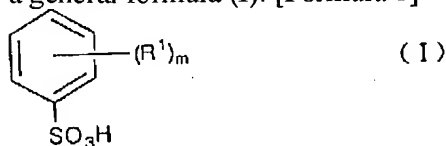
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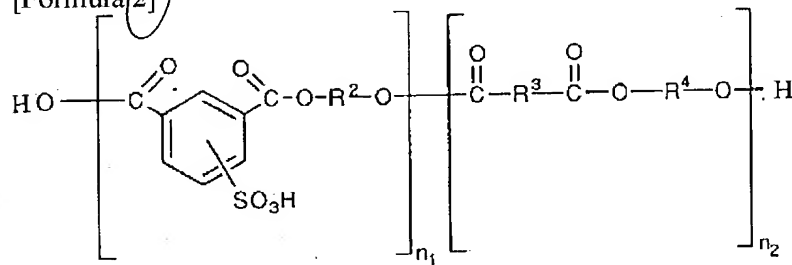
CLAIMS

[Claim(s)]

[Claim 1] The poly aniline whose weight average molecular weight is less than 10000 and/or its derivative, and a general formula (I): [Formula 1]



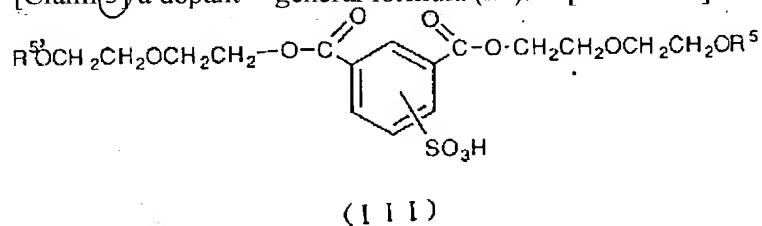
(-- the inside of a formula and R1 are the same -- or you may differ and hydrogen or an alkyl group, an alkoxy group, an alkoxy carbonyl group, a polyoxyalkylene carbonyl group, an alkenyl radical, an alkylthio alkyl group, an aryl group, an alkyl aryl radical, an arylated alkyl radical, an alkoxyalkyl group, an alkylthio group, an alkyl sulfinyl group, an alkyl sulfonyl group, a carboxyl group, a nitrile group, hydroxyl, a nitro group, a halogen, and m show the integer of 1 to 5, respectively --) -- compound and general formula (II): expressed --



(-- the inside of a formula, R2, R3, and R4 are the same -- or you may differ and n1 and n2 are the same in an alkylene group or a phenylene group respectively -- or you may differ and the integer of 1 to 50 is shown, respectively --) -- the organic polymer constituent which contains at least one of the compounds expressed as a dopant.

[Claim 2] R2 and R3 And R4 Organic polymer constituent according to claim 1 with which at least one contains one or more substituents chosen from the group which consists of an alkyl group, an alkenyl radical, an alkoxy group, an alkylthio group, an alkylthio alkyl group, an aryl group, an alkyl aryl radical, an arylated alkyl radical, an alkyl sulfinyl group, an alkoxyalkyl group, an alkyl sulfonyl group, an alkoxy carbonyl group, a nitro group, and a halogen.

[Claim 3] a dopant -- general formula (III): -- [Formula 3]



(-- the inside of a formula, R5, and R5' are the same -- or you may differ and the alkyl group, the alkenyl radical, the alkylthio alkyl group, the aryl group, the alkyl aryl radical, arylated alkyl radical, or alkoxyalkyl group of carbon numbers 1-10 is shown, respectively --) -- the organic polymer constituent according to claim 1 which is a compound expressed.

[Claim 4] A dopant sets to a general formula (II) and is R2. And R4 It is an alkylene group R3 m - A phenylene group is shown and it is n2. At the integer of 10 to 40, it is n1 / n2. Organic polymer constituent according to claim 1 which is the polymer acid which is 0.1 to 1.

[Claim 5] The organic polymer constituent according to claim 1 whose loadings of a dopant are more than equivalence to the poly aniline and/or its derivative.

[Claim 6] The organic polymer constituent according to claim 1 whose weight average molecular weight of the poly aniline and/or its derivative is 9000 or less.

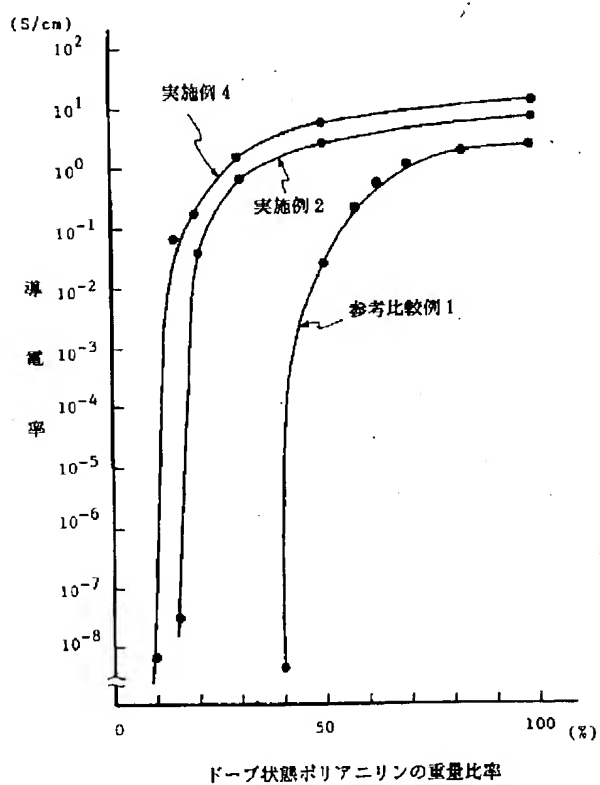
[Claim 7] The conductive thin film containing an organic polymer constituent according to claim 1.

[Claim 8] The conductive thin film according to claim 7 whose conductivity is more than 10^{-9} (S/cm).

[Claim 9] The conductive thin film according to claim 7 which applies the solution containing an organic polymer constituent according to claim 1 to 6 on a base material, and is characterized by making it dry and being obtained.

[Claim 10] The manufacture approach of the conductive thin film which applies the solution containing an organic polymer constituent according to claim 1 to 6 on a base material, and is characterized by making it dry.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the method of manufacturing a conductive thin film, and the obtained conductive thin film from the organic polymer constituent which contains the meltable poly aniline and/or its derivative in an organic solvent in the state of a dope (condition that a dopant lives together), and this constituent. Since the organic polymer constituent of this invention is meltable to a solvent in the state of a dope, the solution of this constituent can be applied to a base material, and moldings, such as a film and a sheet, can be manufactured by the simple method of drying. The thin film furthermore obtained is useful as an antistatic nature film and a transparent conductive film.

[0002]

[Description of the Prior Art] The conductive organic polymer which contains electrolyte ion as a dopant is obtained by carrying out the chemistry oxidation polymerization of the aromatic compounds, such as an aniline, a pyrrole, and a thiophene, using a chemistry oxidizer. However, generally, since an organic polymer was non-** and was insoluble to an aqueous solvent and an organic solvent, fabrication was difficult and had become the serious failure of application expansion.

[0003] About the poly aniline, the approach (JP,3-28229,A) a dedope poly aniline (poly aniline in which a dopant does not exist) processes a moldings into a polar organic solvent of a certain kind using a meltable thing is proposed. However, according to this approach, two processes of the process which adds a dopant were required for the process which acquires a Plastic solid from a dedope poly aniline, and the acquired Plastic solid, and it was complicated.

[0004] The approach (WO No. 22911 [92 to] official report) of solubilizing a dope poly aniline (poly aniline with which a dopant coexists) is proposed. However, this approach was harmful and had problems, such as using a strong corrosive solvent and using superfluous corrosive proton acid as a dopant.

[0005] Moreover, the method (JP,3-285983,A) of dissolving a dope poly aniline in the polar organic solvent which added ammonia or an volatile amine is also proposed. However, this approach also had the trouble that sometimes harmful ammonia or amine gas occurred. [removal / after shaping / solvent]

[0006] The water-soluble poly aniline (JP,5-178989,A) of the self-doping mold which carried out direct coupling of the sulfonic group which furthermore serves as a dopant to the polymer frame is also proposed. However, this poly aniline had the complicated production process, and the problem was in the cost side.

[0007] On the other hand, the approach (JP,2-69525,A) of carrying out the chemistry oxidation polymerization of an aniline or its derivative under existence of a base material is proposed as an approach of making the thin film of the poly aniline forming. However, this approach was unsuitable to industrial large scale production.

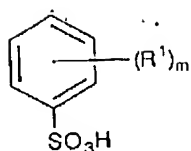
Thus, there were many troubles in using the poly aniline industrially.

[0008]

[Means for Solving the Problem] an organic polymer constituent meltable [this invention persons / to a general-purpose solvent] in the state of a dope, and cheap -- and as a result of inquiring wholeheartedly that the conductive thin film formed should be developed, the specific dopant found out that the with a weight average molecular weight of less than 10000 poly aniline and/or its derivative could be made into solvent fusibility in the state of a dope, and completed this invention.

[0009] That is, this invention is the poly aniline whose weight average molecular weight is less than 10000 and/or its derivative, and general formula (I): [0010].

[Formula 4]

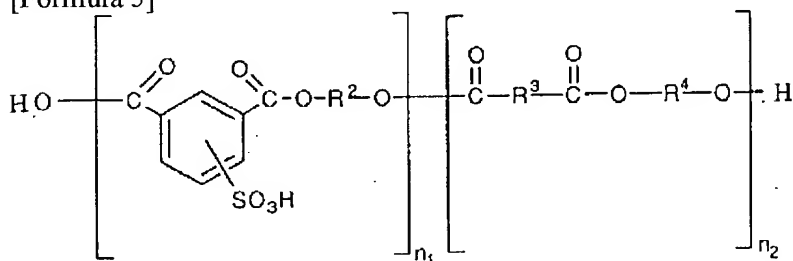


(I)

[0011] (-- the inside of a formula and R1 are the same -- or you may differ and hydrogen or an alkyl group, an alkoxy group, an alkoxy carbonyl group, a polyoxyalkylene carbonyl group, an alkenyl radical, an alkylthio alkyl group, an aryl group, an alkyl aryl radical, an arylated alkyl radical, an alkoxyalkyl group, an alkylthio group, an alkyl sulfinyl group, an alkyl sulfonyl group, a carboxyl group, a nitrile group, hydroxyl, a nitro group, a halogen, and m show the integer of 1 to 5, respectively --) -- compound and general formula (II):

[0012] expressed

[Formula 5]



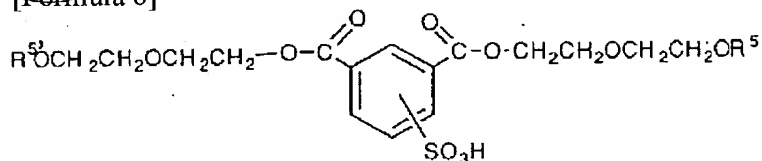
(I I)

[0013] (-- the inside of a formula, R2, R3, and R4 are the same -- or you may differ and an alkylene group or a phenylene group, n1, and n2 are the same respectively -- or you may differ and the integer of 1 to 50 is shown, respectively --) -- it is related with the manufacture approach of the conductive thin film containing the organic polymer constituent which contains at least one of the compounds expressed as a dopant, and this constituent, and this conductive thin film.

[0014] R1 with a desirable general formula (I) It carries out and an alkyl group, an alkoxy group, an alkoxy carbonyl group, an alkoxyalkyl group, a polyoxyalkylene carbonyl group, etc. of carbon numbers 1-15 are mentioned. Especially the alkoxy carbonyl group, the alkoxy group, alkoxyalkyl group, and polyoxyalkylene carbonyl group of carbon numbers 1-15 are desirable especially.

[0015] Especially, it is general formula (III): [0016].

[Formula 6]



(I I I)

[0017] (-- the inside of a formula, R5, and R5' are the same -- or -- differing -- **** -- respectively -- carbon numbers 1-10 -- the alkyl group, the alkenyl radical, the alkylthio alkyl group, the aryl group, the alkyl aryl radical, arylated alkyl radical, or alkoxyalkyl group of 2-8 is shown preferably --) -- especially since the dope poly aniline which added this shows high solubility especially to general-purpose solvents, such as a tetrahydrofuran and 2-butoxyethanol, the sulfonic acid expressed has it. [desirable] In addition, as a desirable compound, it sets to a general formula (I) and m is 2 and R1. The sulfonic acid which has the ester group, the alkoxy group, the alkoxy carbonyl group, the alkoxyalkyl group and/or the polyoxyalkylene carbonyl group especially alkoxy carbonyl group, or polyoxyalkylene carbonyl group of carbon numbers 1-15 is mentioned.

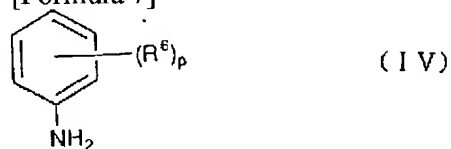
[0018] R2 with a desirable general formula (II), and R3 And R4 It carries out and the alkylene group and phenylene group of carbon numbers 1-10 are mentioned, respectively. inside -- R2 ***** -- the alkylene group of carbon numbers 2-10 -- R3 ***** -- a phenylene group -- R4 ***** -- especially the alkylene group of carbon numbers 2-10 is desirable. R2 and R3 And R4 One or more substituents chosen from the group which consists of the alkyl group, the alkenyl radical, the alkoxy group, the alkylthio group, the alkylthio alkyl group,

the aryl group, the alkyl aryl radical, the arylated alkyl radical, the alkyl sulfinyl group, the alkoxyalkyl group, the alkyl sulfonyl group, the alkoxy carbonyl group, nitro group, and halogen of carbon numbers 1-20, respectively may permute. R2 and R3 And R4 As a desirable substituent, the alkyl group and alkoxy group of carbon numbers 1-20 are mentioned, respectively.

[0019] As an example of an especially desirable compound (II), it sets to a general formula (II) and is R2 and R4. It is the alkylene group of carbon numbers 5-10 and R3 both. It is m-phenylene group and is n2. At the integer of 10-40, it is n1 / n2. The polymer acid whose ratios are 0.1-1 is mentioned. the compound expressed with a general formula (I) or (II) -- one sort -- or two or more sorts may be used.

[0020] The poly aniline which is another component of the organic polymer of this invention, and/or its derivative are following general formula (IV): [0021].

[Formula 7]



[0022] the inside of a formula and R6 are the same -- or -- differing -- **** -- respectively -- hydrogen -- An alkyl group, an alkenyl radical, an alkoxy group, an alkanoyl radical, an alkylthio group, An aryloxy group, an alkylthio alkyl group, an aryl group, an alkyl aryl radical, An arylated alkyl radical, an alkyl sulfinyl group, an alkoxyalkyl group, An alkyl sulfonyl group, an alkoxy carbonyl group, the amino group, an alkylamino radical, A dialkylamino radical, an aryl thio radical, an aryl sulfinyl group, an aryl sulfonyl group, The oxidation polymerization of a carboxyl group, a halogen, a cyano group, a halo alkyl group, a nitro alkyl group or a cyano alkyl group, and the aniline as which p is expressed in integer **** of 0-5 or its derivative is carried out, and it is obtained.

[0023] Desirable R6 It carries out and hydrogen, the alkyl group of carbon numbers 1-5, an alkoxy group, an aryl group, a cyano group, a halogen, an aryloxy group, etc. are mentioned.

[0024] As an example, an aniline, ortho toluidine, meta toluidine, o-ethylaniline, m-ethylaniline, an o-ethoxy aniline, m-butyl aniline, m-hexyl aniline, m-octyl aniline, 2, 3-dimethylaniline, 2, 5-dimethylaniline, 2, 5-dimethoxy aniline, o-cyano aniline, 2, 5-dichloro aniline, 2-BUROMO aniline, 5-chloro-2-methoxyaniline, 3-phenoxy aniline, etc. are mentioned. these aniline or its derivative -- one sort -- or two or more sorts can be used.

[0025] The poly aniline used by this invention and/or its derivative can be obtained according to one sort or two sorts or more of oxidation polymerizations, the aniline expressed with the above-mentioned formula (IV), and its derivative. For example, it can obtain by adding the solution of an oxidizer and proton acid, or the solution of an oxidizer to the solution or suspension of an aniline and/or its derivative (IV), and proton acid. A polymerization can adopt the usual polymerization method, for example, within the limits of 48 hours, under ordinary pressure, reaction temperature makes mixture stir and is performed from reaction-time 30 minutes between -10 degrees C and 40 degrees C.

[0026] As an oxidizer used in the case of an oxidation polymerization, a ammonium peroxydisulfate, a hydrogen peroxide, secondary salt-ized iron, etc. are mentioned. However, it is not limited to these. A ammonium peroxydisulfate is mentioned as what is used preferably.

[0027] With [an acid dissociation constant electric dissociation exponent value] 4.0 [or less], the proton acid added at the time of an oxidation polymerization can be used without a specific limit. For example, although polymer acids, such as organic acids, such as inorganic acids, such as a hydrochloric acid, a sulfuric acid, a nitric acid, and perchloric acid, benzenesulfonic acid, p-toluenesulfonic acid, m-nitro benzoic acid, and a trichloroacetic acid, polystyrene sulfonate, a polyvinyl sulfonic acid, and a polyvinyl sulphate, can be mentioned, it is not limited to these.

[0028] The weight average molecular weight of the poly aniline used by this invention or its derivative is 9000 or less preferably less than 10000. The inclination for compatibility with other high molecular compounds to also fall [solubility / as opposed to / in a with a weight average molecular weight of 10000 or more dedope poly aniline or its derivative / a general-purpose solvent to the time of said dopant addition] by falling remarkably is seen. when the weight average molecular weight of the poly aniline or its derivative is less than 10000, solubility is maintained also in a dope condition -- having -- moreover -- or [and / that the thin film produced, a film, etc. are chemical and / that a physical characteristic carries out macromolecule quantification of the

dopant] -- or it is kept good by mixing with other high molecular compounds mentioned later. The above-mentioned poly aniline and/or its derivative are obtained in said polymerization method by choosing the polymerization conditions from which weight average molecular weight becomes less than 10000.

[0029] The organic polymer constituent of this invention can be obtained by adding a dopant at the time of the oxidation polymerization of an aniline and/or its derivative. Or by processing the dope poly aniline obtained using proton acid by bases, such as aqueous ammonia, it can dedope, a desired dopant can be again added to this dedope poly aniline, and it can also consider as the organic polymer constituent of this invention.

[0030] Even if the equivalent is sufficient as the amount of a dopant and it applies it superfluously to the poly aniline and/or its derivative, it does not interfere. It is 1-3Eq to the poly aniline and/or its derivative preferably. In addition, to the poly aniline or its derivative, the loadings of a dopant cannot give sufficient solvent solubility for the poly aniline of a dope condition as it is under the equivalent, and they stop being able to give high conductivity to a thin film easily.

[0031] The solvent which the organic polymer constituent of this invention may dissolve can be especially used without a limit, if generally used as a general-purpose solvent. For example, polar solvents, such as halogenated hydrocarbon, such as aromatic hydrocarbon, such as ketones, such as nitril, such as alcohols, such as ether, such as a tetrahydrofuran, a methanol, and ethanol, and an acetonitrile, and a methyl ethyl ketone, a xylene, and toluene, and chloroform, N-methyl pyrrolidone, dimethylformamide, and dimethyl sulfoxide, are mentioned. In addition, the corrosive and toxic low thing of the solvent to be used is desirable.

[0032] When manufacturing moldingses, such as a film and a sheet, from the organic polymer constituent of this invention, it can mix with other matrix high molecular compounds. As such a matrix high molecular compound, polyester, polystyrene, polyethylene, a polyamide, a polyvinyl chloride, polyvinyl acetate, polypropylene, a styrene-butadiene copolymer, polybutadiene, a polysiloxane, a polycarbonate, a polyacrylonitrile, polymethylmethacrylate, ABS plastics, etc. are mentioned.

[0033] for example, the thing made for the side chain of a dopant to contain many ester bonds when the matrix high molecular compound to mix is polyester -- moreover, when a matrix high molecular compound is a polyamide, the compatibility over the matrix high molecular compound of a dope poly aniline can be raised by making the side chain of a dopant contain many amide association. Moreover, the mixing ratio of a dope poly aniline, or its derivative and matrix high molecular compound will not be limited, especially if the conductivity after thin-film-izing is 10 to 9 or more S/cm as mentioned later.

[0034] Although there is no limitation special to the approach of mixing with the organic polymer constituent of this invention and a matrix high molecular compound, mixing in the state of a solution is desirable. For example, the approach of mixing the solution of the constituent of this invention of a dope condition and a matrix high molecular compound or the method of adding and dissolving each in a solvent at once is mentioned.

[0035] A conductive thin film is obtained by making a base material apply and dry the solution containing the organic polymer constituent of this invention. There is no limitation special to the base material used. For example, metals, glass, etc., such as high molecular compounds, such as polyester and polyethylene, gold, and platinum, are used. Especially limitation does not have the thickness of a base material and it is suitably chosen by the purpose of use.

[0036] Thus, as for the conductivity of the obtained thin film, it is desirable that they are 10 to 9 or more S/cm. Still more desirable conductivity is 10 to 6 or more S/cm. Especially limitation does not have the thickness of a thin film, either and it is suitably chosen by the purpose of use. Generally, 10 micrometers - ten to 4 micrometer is desirable.

[0037]

[Function] The description of the organic polymer constituent of this invention is to use [the poly aniline whose weight average molecular weight is less than 10000 and/or its derivative, and] the compound which the substituent of the structure where a solvent and compatibility are high combined for benzenesulfonic acid as the dopant. That is, when the side chain of this compound used as a dopant mixes with breadth and a solvent molecule in a solvent, a dope poly aniline and/or its derivative can be solubilized. By using this special dopant, the organic polymer constituent which contains the conductive poly aniline which may dissolve in a general-purpose solvent, and/or its derivative for the first time can be offered, and a thin film with good conductivity can manufacture now easily. Furthermore, weight average molecular weight comes be made to the poly aniline which dissolves easily with a general-purpose solvent, and/or its derivative by using less than 10000 poly aniline and/or its derivative.

[0038]

[Example] Although an example is given to below and this invention is more concretely explained to it, this invention is not limited at all by these examples.

[0039] It is 5 to 500ml 3 opening flask equipped with example of reference 1 stirrer, a condensator, distilling-off object draw opening, and a thermometer. - 1.16g of sodium acetate was added as sulfo sodium isophthalic acid dimethyl 20.9g, isophthalic acid dimethyl 41.0g, neopentyl glycol 399.4g, and a reaction catalyst, and it was made to react at 200 degrees C for 4 hours. According to reaction advance, it became a transparence homogeneity liquid from white suspension, and the methanol of computational complexity distilled. Furthermore, unreacted neopentyl glycol was distilled off by 200 degrees C and 80mmHg in 1.5 hours.

[0040] As the 33.4g of the above-mentioned mixture, and a polycondensation catalyst, 6.3mg of antimony oxide was added, with nitrogen gas, the inside of a reactor was permuted enough, and carried out afterbaking to the glass reactor which an agitator, nitrogen installation reduced pressure tubing, and a thermometer attached, reduced pressure was started from 260 degrees C, and it decompressed to 0.3mmHg(s) over 30 minutes. Terminal temperature was 275 degrees C. N- When GPC was performed by using a methyl pyrrolidone as a solvent, number average molecular weight was 3100 in polystyrene conversion.

[0041] It is 5 to 300ml 3 opening flask equipped with example of reference 2 agitator, distilling-off object draw tubing, and a thermometer. - As sulfo sodium isophthalic acid dimethyl 27.8g, diethylene-glycol-Monod n-butyl ether 207.8g, and an esterification catalyst, 0.067g of zinc acetate was added and it reacted at 210 degrees C for 8 hours. It took to reaction advance, and became a transparence homogeneity liquid from white suspension, and the methanol of computational complexity distilled. Furthermore, unreacted diethylene-glycol-Monod n-butyl ether was distilled by 220 degrees C and 70mmHg in 2 hours.

[0042] After dissolving 6.5g of oligomer-like compounds compounded in the example 1 of example of reference 3 reference in methyl-ethyl-ketone 40ml, 400ml of hydrochloric acids was added 12%, stirring. The generated nebula object was filtered with the glass filter after 1-hour stirring, and 35ml of hydrochloric acids washed 3 times 12 more%. Reduced pressure drying was carried out at the room temperature after washing on the 1st. The part was used as the water solution after desiccation, and it titrated in the 0.02 convention sodium-hydroxide water solution, and confirmed that the sulfo sodium group was quantitatively changed into the sulfonic group.

[0043] 20g (Amberlyst 15) of ion-exchange resin was added to 15ml of THF solutions of 1g of diester compounds compounded in the example 2 of example of reference 4 reference, and it stirred for 15 minutes at the room temperature. The glass filter washed this ion exchange resin by THF 16ml again the back according to **, and it united with filtrate. It titrated in the sodium-hydroxide water solution of 0.02 conventions, and confirmed that the sulfo sodium group was quantitatively changed into the sulfonic group.

[0044] 3 opening flask 300ml equipped with example 1 agitator and the thermometer was made to carry out mixed distribution of 5.0g of sulfonic-acid residue content oligomer-like compounds of the example 3 of reference, and the aniline 0.5g into 100ml of distilled water, and it cooled to it at 0 degree C. It cools at 0 degree C beforehand, and 10ml of water solutions of 0.6g of ammonium peroxydisulfates which are a polyacid-ized agent was dropped in 10 minutes. After keeping the reaction mixture at 0 degree C and stirring it for 5 hours, the generated dope poly aniline was carried out the ** exception, and was rinsed. Day reduced pressure drying was carried out at the room temperature, and the 3.8g dope poly aniline was obtained. Conductivity sigma was 2.1 S/cm, when the obtained specified substance was pressed into the pellet and having been measured with the four probe method. When ultrasonic irradiation of the powder-like poly aniline 0.5g was added and carried out to THF 10ml, the solution of uniform dark green was obtained. When this solution was filtered with G4 glass filter, the insoluble matter which remained on the filter was very little. This poly aniline 0.3g was processed at the room temperature by 30ml of aqueous ammonia 3% for 2 hours, the ** exception, it rinsed and dried and the dedope poly aniline was obtained. When the dedope poly aniline was dissolved in NMP (N-methyl pyrrolidone) and having been measured by GPC, weight average molecular weight was 9000 in polystyrene conversion.

[0045] The THF solution of a dope poly aniline and the THF (tetrahydro furan) solution of Byron resin RV-280 by Toyobo Co., Ltd. which were obtained in the example 2 example 1 were mixed at a various rate, it was made to apply and thin-film-ize on a polyethylene terephthalate film (1 micrometer of thickness), and conductivity was measured. A result is shown in drawing 1. In the case of which, phase separation was not seen when the thin film was observed with the optical microscope (400 times). When the rates of a dope poly aniline were 15, 20, and 30 or 50 % of the weight, the adhesion of a thin film was 100% and the pencil degree of hardness was

2H. These test methods were performed by the following approaches.

[0046] Adhesion: After mincing the squares with the cutter knife on the surface of the thin film and sticking a cellophane tape, the number which exfoliated and remained among measure 100 individuals was counted.

Pencil degree of hardness: According to JIS-K-5401 law, it examined by the existence of a 200g [of loads] blemish using the pencil length **** test coupon.

[0047] When ultrasonic irradiation of the dedope poly aniline 0.1g of 0.3g of sulfonic-acid residue-content diester compounds and weight average molecular weight 9000 obtained in the example 4 of example 3 reference was added and carried out to THF8ml, the solution of uniform dark green was obtained in 3 hours. When this solution was filtered with the glass filter, the insoluble matter which remained on the filter was very little. This dope condition poly aniline THF solution was applied on the polyethylene terephthalate film, and was dried at 120 degrees C for 1 hour, and the thin film of 1 micrometer of thickness was obtained. Conductivity sigma was 12 S/cm when measured by the one terminal pair network method about the obtained thin film.

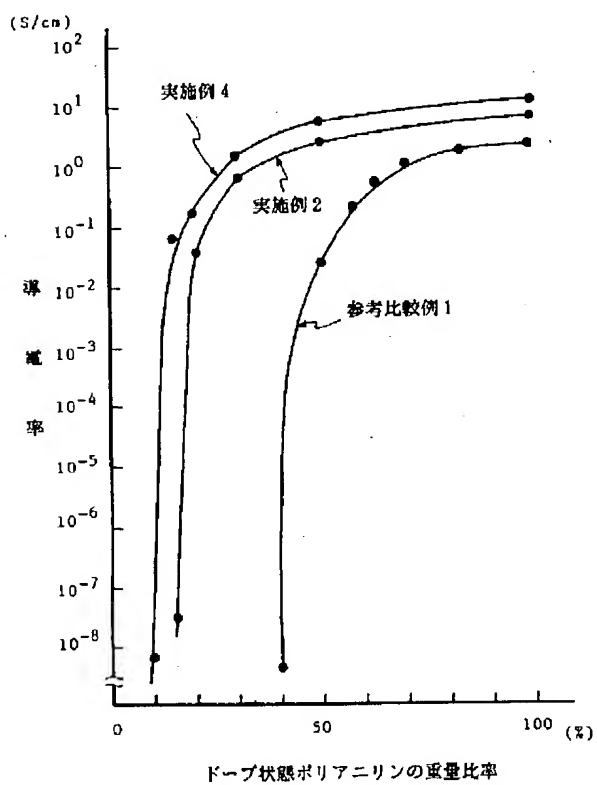
[0048] the THF solution of the dope poly aniline obtained in the example 4 example 3, and the Toyobo Co., Ltd. make -- versatility came out of the THF solution of Byron resin RV-280 comparatively, and it mixed, and it was made to apply and thin-film-ize on a polyethylene terephthalate film (1 micrometer of thickness), and conductivity was measured. A result is shown in drawing 1. In the case of which, phase separation was not seen when the thin film was observed with the optical microscope (400 times). When the rates of a dope poly aniline were 10, 15, 20, and 30 or 50 % of the weight, the adhesion of a thin film was 100% and the pencil degree of hardness was 2H.

[0049] After adding dedope poly aniline 0.1g of 0.56g of sulfonic-acid residue content oligomer-like compounds, and weight average molecular weight 14000 obtained in the example 3 of example of comparison reference 1 reference to THF8ml and performing ultrasonic irradiation for 8 hours, it filtered with G4 glass filter. After drying, when it washed the insoluble matter which remained on the filter by THF, and weighing capacity was carried out, there was 0.08g. moreover, the THF solution of the dope poly aniline filtered and obtained and the Toyobo Co., Ltd. make -- versatility came out of the THF solution of Byron resin RV-280 comparatively, and it mixed, and it was made to apply and thin-film-ize on a polyethylene terephthalate film (1 micrometer of thickness), and conductivity was measured. A result is shown in drawing 1. Although phase separation was seen when the thin film was observed with the optical microscope (400 times), and the rates of a dope poly aniline were 40, 50, 55, 60, and 70 or 80 % of the weight, the adhesion of a thin film was all 100% in these cases, and the pencil degree of hardness was 2H.

[0050]

[Effect of the Invention] since the organic polymer constituent of this invention contains the poly aniline of a meltable dope condition, and/or its derivative in a general-purpose organic solvent -- this -- a solution -- carrying out -- this solution -- a direct base material top -- applying -- a solvent -- removing -- film-izing -- it can thin-film-ize. Thus, if the constituent of this invention is used, the film of a conductive organic polymer will be obtained easily, for example, it will be used suitable for an antistatic ingredient and a transparent conductive film. After mixing with other polymeric materials in a solution furthermore, film-ization and thin-film-izing are also possible.

[Translation done.]



[Translation done.]